

(19)



(11)

EP 4 227 457 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.08.2023 Bulletin 2023/33

(51) International Patent Classification (IPC):
D06F 37/26 ^(2006.01) **D06F 58/20** ^(2006.01)
D06F 25/00 ^(2006.01) **D06F 58/02** ^(2006.01)

(21) Application number: **22156757.1**

(52) Cooperative Patent Classification (CPC):
D06F 58/20; D06F 37/266; D06F 25/00; D06F 58/02

(22) Date of filing: **15.02.2022**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **BSH Hausgeräte GmbH**
81739 München (DE)

(72) Inventors:
• **Li, Mingyu**
14469 Potsdam (DE)
• **Zhang, Jun(PLC)**
Nanjing, 210046 (CN)

(54) LAUNDRY CARE MACHINE INCLUDING A GASKET AND A CONNECTOR

(57) The invention relates to a laundry care machine including a tub 1 for receiving laundry to be dried by an air flow passing through said tub 1, a gasket 2 connecting said tub 1 to a housing 3 and defining an access 4 to said tub 1, and a door 5 provided for closing the access 4 sealed by said gasket 2, and said gasket 2 including a

connector 9 for connecting a channel 10 for providing the air flow to said tub 1. Further, an insert 11 protruding into said connector 9 is coupled to said connector 9 and said channel 10, said insert 11 including a lip 12 projecting towards said tub 1 and configured for directing the air flow into said tub 1.

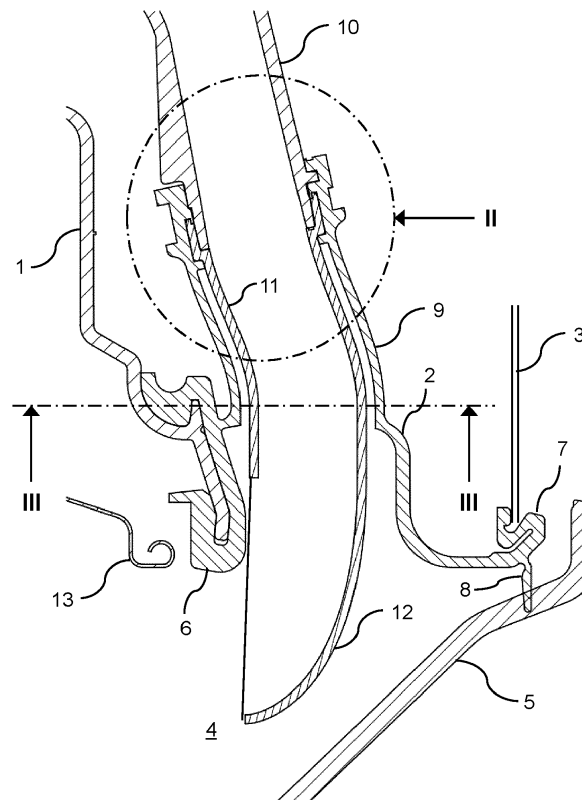


Fig. 1

EP 4 227 457 A1

Description

[0001] The invention relates to a laundry care machine including a tub for receiving laundry to be dried by an air flow passing through said tub, a gasket connecting said tub to a housing and defining an access to said tub, and a door provided for closing the access sealed by said gasket, and said gasket including a connector for connecting a channel for providing the air flow to said tub.

[0002] Document CN 106 968 090 A discloses a laundry care machine as defined above. In that laundry care machine, the channel for providing the air flow opens directly into the gasket. Consequently, the air flow which has been heated just prior to reaching the gasket is guided by the structures of the gasket, subjecting these to a temperature which may exceed the temperature of boiling water at 100 °C on purpose of ascertaining proper and effective drying of humid laundry subject to care.

[0003] Accordingly, there is a need for further developing the laundry care machine as defined above for improving resistance to high temperatures as brought by an air flow heated on purpose of drying laundry thereby.

[0004] Therefore, it is an object of the invention to provide a laundry care machine as defined above which includes a proper interface for providing guidance of a heated air flow through a gasket while avoiding excessive thermal load to the gasket.

[0005] On purpose of solving this object the present invention provides a laundry care machine of the generic type as defined in the generic part of the independent claim attached which also includes the features of the characterizing part of said independent claim.

[0006] Preferred embodiments of the invention are defined in dependent claims attached as well as in the subsequent disclosure. Such preferred embodiments may also be applied in mutual combinations insofar as possible under technical considerations to any extent, even if not specified herein explicitly.

[0007] Accordingly the present invention provides, as a solution to the problem as defined above, a laundry care machine including a tub for receiving laundry to be dried by an air flow passing through said tub, a gasket connecting said tub to a housing and defining an access to said tub, and a door provided for closing said access sealed by said gasket, and said gasket including a connector for connecting a channel for providing the air flow to said tub, wherein an insert protruding into said connector is coupled to said connector and said channel, said insert including a lip projecting towards said tub and configured for directing the air flow into said tub.

[0008] Advantages of the invention include that a separate insert is provided for guiding the hot air flow through the gasket, the insert keeping the air flow away from closely contacting the gasket itself and thereby protecting the gasket from possibly excessive thermal load. Eventually, the air flow is also kept away from immediately contacting the door, thereby avoiding excessive thermal load to the door. Such thermal load may not be a problem

for the material of the door, which is glass according to common practice, but it may be a problem if directly exposed to access by a user that might hurt itself by inadvertently touching the glass.

[0009] The invention therefore allows to select a material for forming the gasket which has a limited resistance to high temperatures, thereby allowing selection of a material as convenient for a usual washing machine wherein any thermal load to the gasket is limited by the temperature of boiling water. Such material may be EPDM rubber which is commercially available at low prices. The material of the insert needs to be selected to withstand higher thermal loads, but the insert is a component of much less size and volume than the gasket and may therefore be made from a suitable and more expensive material such as silicone rubber.

[0010] Principally the invention may be applied to any laundry care machine which provides a hot air flow for any purpose. In particular, the household appliance may be a laundry care machine a washer-dryer dedicated to washing and drying batches of laundry.

[0011] In accordance with a preferred embodiment of the invention, said lip defines a nozzle in said insert. Such nozzle is preferably applied for forming a jet of the air flow and directing such jet into the tub, thereby avoiding direct contact between the air flow and the gasket as much as possible. Given that the air flow will be rather hot in most cases, this will avoid undue thermal load to the gasket.

[0012] In accordance with another preferred embodiment of the invention, said insert is fixed between said connector and said channel. Thereby the insert provides heat shielding between the channel and the gasket, which also contributes to avoiding direct contact between the air flow and the gasket as much as possible, and, in case that the air flow is rather hot, avoiding undue thermal load to the gasket.

[0013] In accordance with a further preferred embodiment of the invention, said insert protrudes into said connector with a lateral distance from said connector. This effectively insulates the gasket's connector from the air flow and any thermal load that the air flow may cause, again contributing to avoiding direct contact between the air flow and the gasket as much as possible, and, in case that the air flow is rather hot, avoiding undue thermal load to the gasket. More preferred, distance ribs are provided between said connector and said insert for defining said lateral distance, thereby improving thermal insulation between the air flow and the gasket.

[0014] In accordance with an additional preferred embodiment of the invention, said insert has a cross-section which is stretched along a first axis and includes a flat section between two rounded end sections. Such shape of the insert forms the air flow for efficient insertion into the tub while keeping it away from structures of the gasket and avoiding undue thermal load to the gasket. More preferred, the insert includes reinforcing ribs placed in the flat section which improve the insert's rigidity and

assist in keeping the proper lateral distance between the insert and the connector.

[0015] In accordance with yet another preferred embodiment of the invention, said connector surrounds said insert with an essentially constant lateral distance, thereby providing improved thermal insulation between the insert and the gasket's connector.

[0016] In accordance with yet a further preferred embodiment of the invention, said gasket includes an inner rim configured to be fixed to said tub, and an outer rim configured to be fixed to said housing, and a sealing flange for conforming to said door upon closing said access. Thereby, proper sealing between the tub, the housing, and the door and allowing mutual movement between the tub and the housing is provided.

[0017] In accordance with yet an additional preferred embodiment of the invention, said gasket and said insert consist of rubber materials. Thereby, the gasket and the insert may accommodate mutual movements between the tub and the housing while ascertaining their own proper sealing and insulating functions upon laundry being tumbled in the tub upon care treatment. More preferred, said gasket consists of a first rubber material having a first maximum operating temperature and said insert consists of a second rubber material having a second maximum operating temperature, wherein the second operating temperature is higher than the first maximum operating temperature. Thereby, the rubber material of the gasket may be selected for proper functioning under thermal and mechanical loads as regularly occurring when washing laundry, proper functioning also including proper sealing and inclusion of laundry treating liquid such as water and suds in the tub, and the rubber material of the insert may be selected independently for proper functioning under thermal and mechanical loads as regularly occurring when drying laundry, proper functioning including proper sealing of a hot air flow applied for drying. Even more preferred, the first maximum operating temperature is about 100 °C and thereby equates the boiling temperature of water under normal pressure, and the second maximum operating temperature is about 125 °C which is a maximum temperature preferred for an air flow applicable to drying laundry. Still more preferred, the first rubber material is an EPDM rubber material, and the second rubber material is a silicone rubber material. Silicone rubber material is relatively expensive as compared to EPDM rubber material, but EPDM rubber material has proper elasticity and durability for application in the gasket on purpose of proper sealing during any laundry washing process. Therefore, the gasket with its connector may be constituted of EPDM rubber material according to well-established practice. Application of relatively expensive silicone rubber material may be reserved to the insert for direct exposure to the relatively hot air flow applied for drying. Specifically, the EPDM rubber material selected for constituting the gasket may be 8 EP 381 material obtained from supplier Cikautxo Group, and the silicone rubber material selected for constituting the insert

may be 3 SI material obtained from the same supplier. Thereby, the gasket and the insert may be formed integrally each by respective injection moulding.

[0018] In accordance with still another preferred embodiment of the invention, a drum is rotatably disposed in said tub for receiving the laundry and configured for tumbling the laundry during any care process such as washing and drying.

[0019] In accordance with still a further preferred embodiment of the invention, the laundry care machine is configured as a washer-dryer for washing and drying laundry.

[0020] Various preferred embodiments of the invention are explained in detail subsequently with reference to the Figures of the attached drawing. These Figures show and exhibit as follows:

Fig. 1 a schematic view of a vertical section of a laundry care machine featuring a gasket and an insert;

Fig. 2 a partial view as indicated by the line with label "II" in Fig. 1;

Fig. 3 a partial view as indicated by the circle with labels "III" in Fig. 1; and

Fig. 4 a schematic horizontal view of the gasket of Fig. 1.

[0021] As shown in detail in Fig. 1, a laundry care machine includes a tub 1 for receiving laundry to be dried by an air flow passing through tub 1, a gasket 2 connecting tub 1 to a housing 3 and defining an access 4 to said tub 1. A door 5 is provided for closing access 4 sealed by gasket 2.

[0022] Tub 1 being swingably suspended in housing 3 on purpose of absorbing reaction forces generated upon tumbling laundry in tub 1, gasket 2 is provided on purpose of providing a seal between the inside of tub 1, the inside of housing 3 outside tub 1, and the outside of the laundry care machine. For these reasons gasket 2 is made from an elastic rubber, specifically an EPDM rubber, to provide sealing which is stable and reliable under swinging movements of tub 1 within housing 3, and stable also under subjection to chemicals such as usually present in suds prepared for washing, rinsing, or softening laundry. The rubber material of gasket 2 is conventionally selected to withstand all temperatures that might occur during care of laundry, specifically washing of laundry, whereby a minimum operating temperature may be set at or near 0 °C, which is the freezing point of water at normal pressure, and a maximum operating temperature may be set at 100 °C, which is the boiling point of water at normal pressure. Gasket 2 includes an inner rim 6 fixed to tub 1, and an outer rim 7 fixed to housing 3, and a sealing flange 8 for conforming to door 5 upon closing said access 4. It may be noted that Fig. 1 does not show sealing

flange 8 conform to door 5 as it closes access 4 but sealing flange 8 as exposed when door 5 has been opened.

[0023] In the present embodiment the laundry care machine is provided for washing laundry as well as drying laundry, on purpose of which means are added to the laundry care machine for providing a circulating air flow to humid laundry in tub 1. These means include a fan for driving the air flow, a heater for heating the air flow, and a condenser for extracting humidity from the air flow, all not shown in the drawing for the sake of clarity. In addition, gasket 2 includes a connector 9 for connecting a channel 10, wherein the fan, the heater, and the condenser are included, for providing the air flow to tub 1.

[0024] Further, an insert 11 protruding into connector 9 is coupled to connector 9 and channel 10, insert 11 including a lip 12 projecting towards tub 1 and configured for directing the air flow into tub 1. Lip 12 defines a nozzle in insert 11. Insert 11 is fixed between channel 10 and said connector 9 and protrudes into connector 9 with a lateral distance from connector 9. Thereby, the air flow passing from channel 10 to tub 1 is isolated from connector 9. Considering that it may be desired to heat the air flow prior to entering tub 1 for improving pickup of humidity from humid laundry place in tub 1, a limitation of operating temperature of gasket 2's material may, at least to some extent, be withdrawn from pertinence in view of the temperature that the air flow passing into tub 1 may have, by selecting a proper material with an appropriately higher maximum operating temperature for insert 11.

[0025] Accordingly, both gasket 2 and insert 11 consist of rubber materials, wherein gasket 2 consists of a first rubber material having a first maximum operating temperature and insert 11 consists of a second rubber material having a second maximum operating temperature, wherein the second operating temperature is higher than the first maximum operating temperature. Specifically, the first maximum operating temperature which applies to gasket 2 is about 100 °C, and the second maximum operating temperature which applies to insert 11 is about 125 °C. While the first rubber material which constitutes gasket 2 is an EPDM rubber material, the second rubber material which constitutes insert 11 is a silicone rubber material. Silicone rubber material being relatively expensive as compared to EPDM rubber material and EPDM rubber material having proper elasticity and durability for application in gasket 2, it is possible to constitute gasket 2 of EPDM rubber material according to well-established practice and reserve application of relatively expensive silicone rubber material to insert 11. Presently, the EPDM rubber material selected for gasket 2 is 8 EP 38I material obtained from supplier Cikauxo Group, and the silicone rubber material is 3 SI material obtained from the same supplier. Thereby, gasket 2 and insert 11 may be formed integrally by respective injection moulding.

[0026] Insert 11 protruding into connector 9 with lip 12 projecting towards tub 1 and forming a nozzle, insert 11 is properly configured for directing the air flow directly

into tub 1 without passing too close along gasket 2. Thereby, excessive thermal load upon gasket 2 by the air flow having a temperature well above 100°C such as 125 °C is reliably avoided. Likewise, contact between the air flow and laundry being received and tumbled in a drum 13 rotatably disposed in tub 1 is improved, thereby increasing effectivity of the drying process applying the air flow.

[0027] Fig. 2 shows an enlarged portion of the view exhibited by Fig. 1, as indicated by the circle labelled II. Fig. 2 exhibits connector 9 with insert 11 inserted and fixed into an annular first groove 14. A second groove 15 is formed in connector 9 above first groove 14 and insert 11 for receiving a corresponding part of channel 10, not shown in Fig. 2 for the sake of clarity. An annular shoulder 16 is provided in insert 11 for seating channel 10, thereby avoiding any direct contact between channel 10 and connector 9 as apparent from Fig. 1, and as appropriate for avoiding undue thermal load on connector 9 during operation.

[0028] Fig. 3 exhibits a transversal section through connector 9 and insert 11, as indicated by the line labelled "III" in Fig. 1. Accordingly, distance ribs 17 are provided between connector 9 and insert 11 for defining an essentially constant lateral distance between connector 9 and insert 11. As well as connector 9, insert 11 has a cross-section which is shaped as a racetrack and stretched along a first axis 18 and includes a flat section 19 between two rounded end sections 20. Insert 11 further includes reinforcing ribs 21 placed in the flat section 19, providing structural stability to insert 11 and connector 9.

[0029] Fig. 4 exhibits a schematic horizontal view of gasket 2 of Fig. 1, as seen from below. Gasket 2 includes inner rim 6 fixed to tub 1, and outer rim 7 configured to be fixed to housing 3 as in Fig. 1. Insert 11 appears to exhibit its direction towards drum 13, its direction appearing to be vertically downwards in Fig. 4, for properly guiding the air flow to laundry placed and being tumbled in drum 13.

[0030] The invention provides separate insert 11 for guiding the hot air flow through gasket 2, insert 11 keeping the air flow away from closely contacting gasket 11 itself and thereby protecting gasket 11 from possibly excessive thermal load. Eventually, the air flow is also kept away from immediately contacting door 5, thereby keeping low thermal load to door 5. Such thermal load may not be a problem for the material of door 5, which may be glass according to common practice, but it may be a problem if door 5 thus loaded is directly exposed to access by a user that might hurt itself by inadvertently touching the glass.

[0031] The invention therefore allows to select a material for forming gasket 2 which has a limited resistance to high temperatures, thereby allowing selection of a material as convenient for a usual washing machine wherein any thermal load to gasket 2 is limited by the temperature of water boiling under normal pressure. Such material may be EPDM rubber which is commercially available at

low prices. The material of insert 11 may need to be selected to withstand higher thermal loads than the material of gasket 2 but insert 11 is a component of much less size and volume than gasket 2 and may therefore be made from a suitable and more expensive material such as silicone rubber.

List of Reference Numerals

[0032]

- 1 Tub
- 2 Gasket
- 3 Housing
- 4 Access
- 5 Door
- 6 Inner rim
- 7 Outer rim
- 8 Sealing flange
- 9 Connector
- 10 Channel
- 11 Insert
- 12 Lip
- 13 Drum
- 14 First groove
- 15 Second groove
- 16 Shoulder
- 17 Distance rib
- 18 First axis
- 19 Flat section
- 20 Rounded section
- 21 Reinforcing rib

Claims

1. A laundry care machine including a tub (1) for receiving laundry to be dried by an air flow passing through said tub (1), a gasket (2) connecting said tub (1) to a housing (3) and defining an access (4) to said tub (1), and a door (5) provided for closing the access (4) sealed by said gasket (2), and said gasket (2) including a connector (9) for connecting a channel (10) for providing the air flow to said tub (1), **characterized in that** an insert (11) protruding into the connector (9) is coupled to said connector (9) and said channel (10), said insert (11) including a lip (12) projecting towards said tub (1) and configured for directing the air flow into said tub (1).
2. The laundry care machine according to claim 1, wherein said lip (12) defines a nozzle in said insert (11).
3. The laundry care machine according to one of the preceding claims, wherein said insert (11) is fixed between said connector (9) and said channel (10).

4. The laundry care machine according to one of the preceding claims, wherein said insert (11) protrudes into said connector (9) with a lateral distance from said connector (9).
5. The laundry care machine according to claim 4, wherein distance ribs (17) are provided between said connector (9) and said insert (11) for defining said lateral distance.
6. The laundry care machine according to one of the preceding claims, wherein said insert (11) has a cross-section which is stretched along a first axis (18) and includes a flat section (19) between two rounded end sections (20).
7. The laundry care machine according to claim 6, wherein said insert (11) includes reinforcing ribs (21) placed in said flat section (19).
8. The laundry care machine according to one of claims 4 to 7, wherein said connector (9) surrounds said insert (11) with an essentially constant lateral distance.
9. The laundry care machine according to one of the preceding claims, wherein said gasket (2) includes an inner rim (6) configured to be fixed to said tub (1), and an outer rim (7) configured to be fixed to said housing (3), and a sealing flange (8) for conforming to said door (5) upon closing said access (4).
10. The laundry care machine according to one of the preceding claims, wherein said gasket (2) and said insert (11) consist of rubber materials.
11. The laundry care machine according to claim 10, wherein said gasket (2) consists of a first rubber material having a first maximum operating temperature and said insert (11) consists of a second rubber material having a second maximum operating temperature, wherein said second operating temperature is higher than said first maximum operating temperature.
12. The laundry care machine according to claim 11, wherein said first maximum operating temperature is about 100 °C, and said second maximum operating temperature is about 125 °C.
13. The laundry care machine according to one of claims 10 and 11, wherein said first rubber material is an EPDM rubber material, and said second rubber material is a silicone rubber material.
14. The laundry care machine according to one of the preceding claims, wherein a drum (13) is rotatably disposed in said tub (1) for receiving the laundry and

configured for tumbling the laundry during care.

15. The laundry machine according to any preceding claim which is configured as a washer-dryer for washing and drying laundry.

5

10

15

20

25

30

35

40

45

50

55

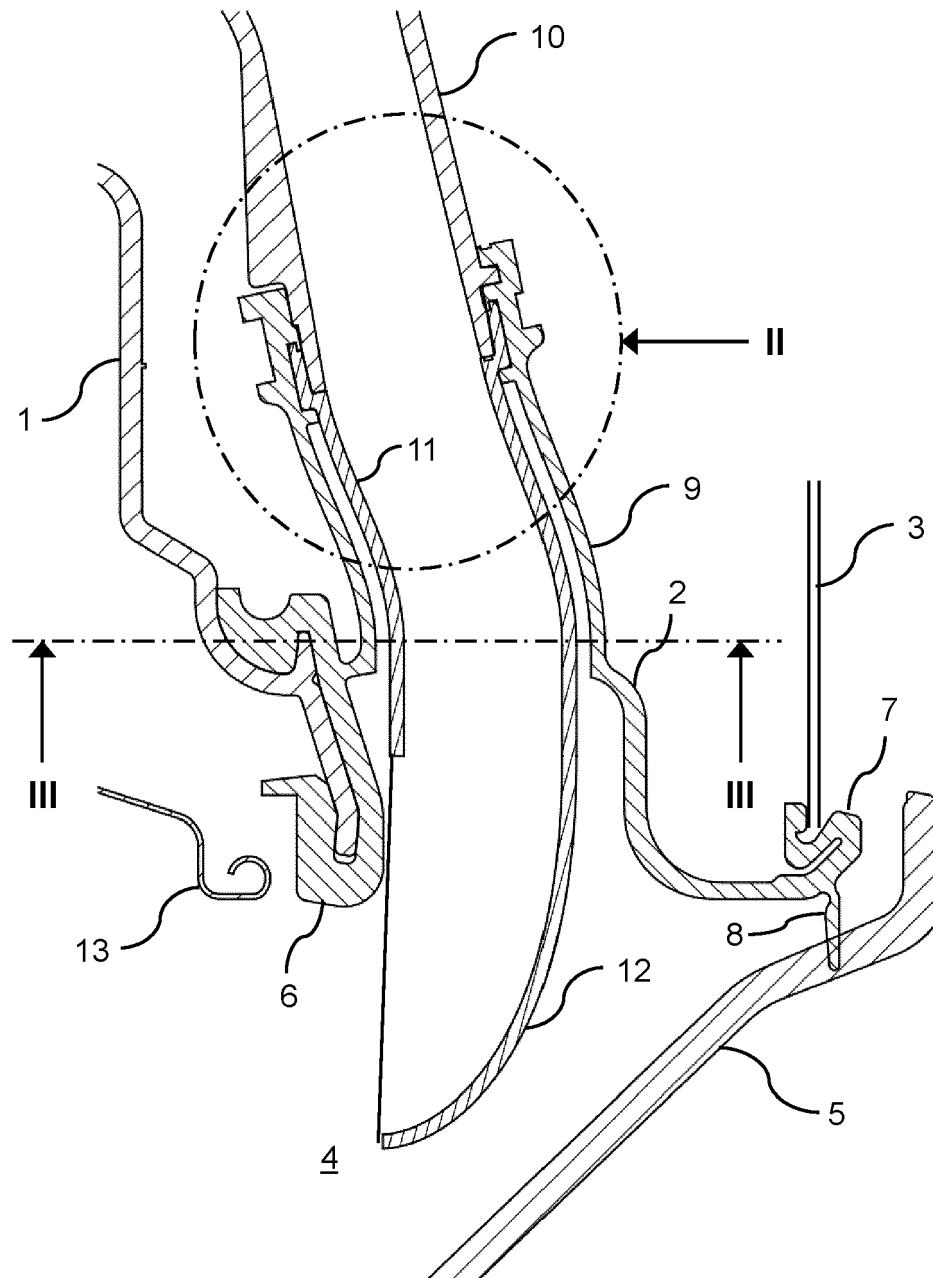


Fig. 1

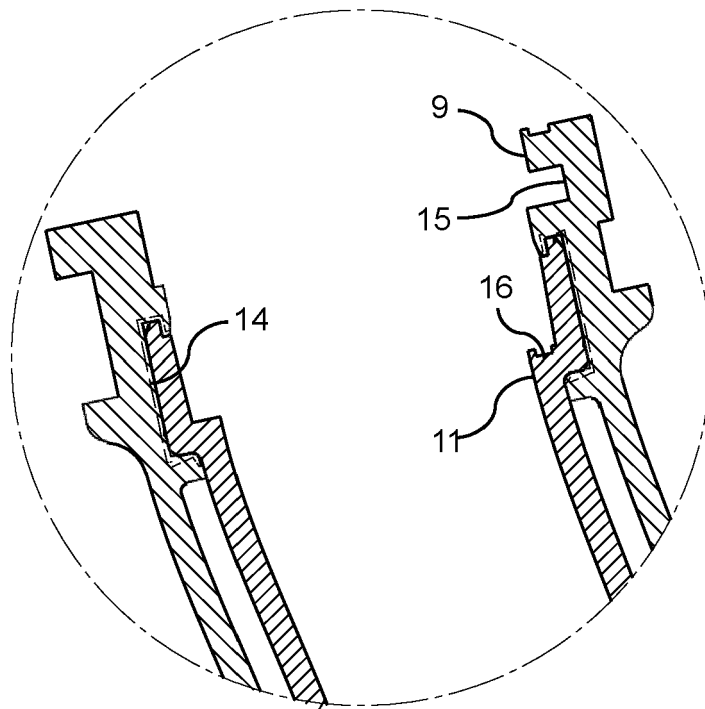


Fig. 2

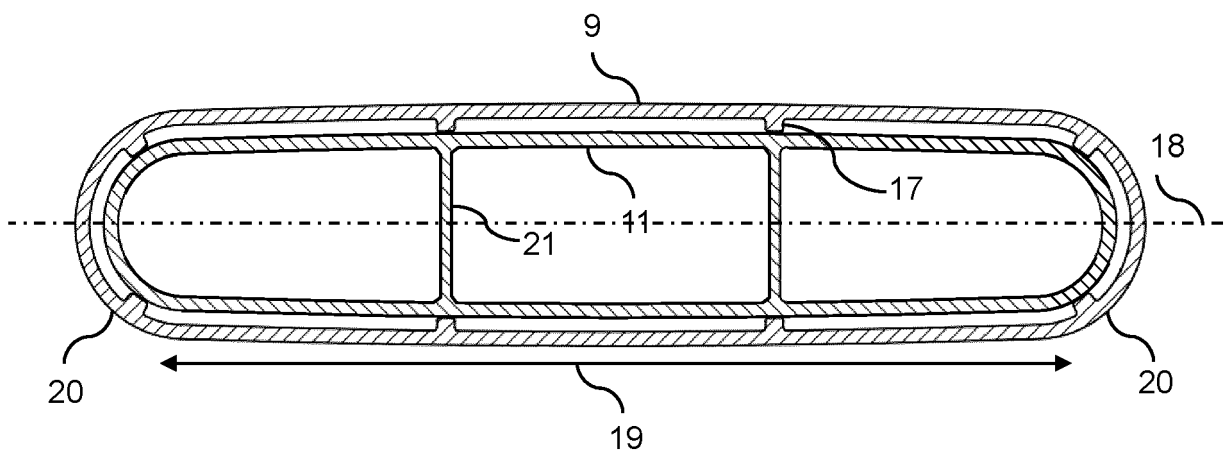
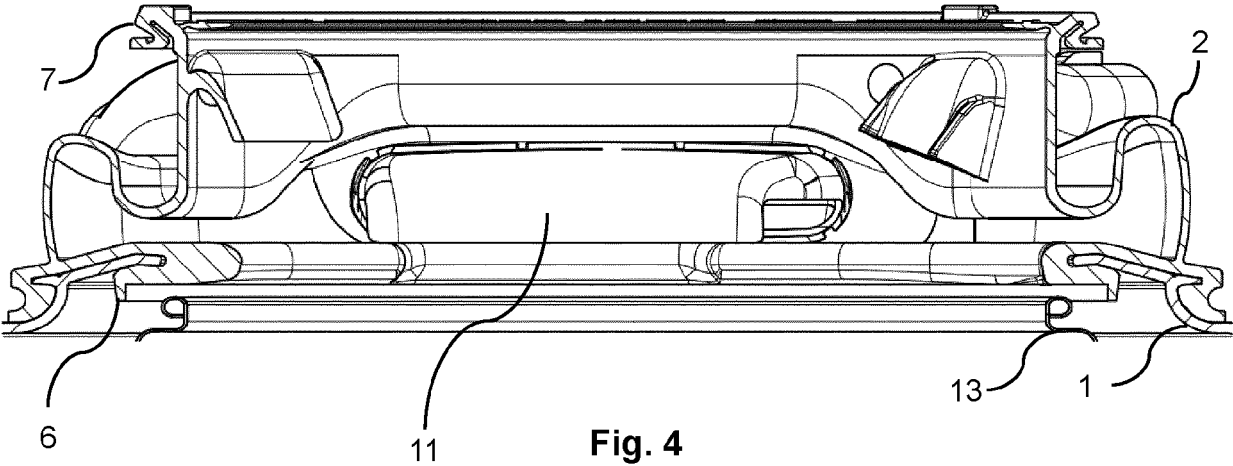


Fig. 3





EUROPEAN SEARCH REPORT

Application Number

EP 22 15 6757

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2020/270793 A1 (KIM WOORE [KR] ET AL) 27 August 2020 (2020-08-27) * figures 1-4 * * paragraph [0002] * * paragraph [0024] * * paragraph [0075] * * paragraph [0084] * * paragraph [0098] * -----	1, 2, 6, 7, 9, 10, 14, 15	INV. D06F37/26 D06F58/20 ADD. D06F25/00 D06F58/02
X	US 2020/248381 A1 (LEE KILRYONG [KR] ET AL) 6 August 2020 (2020-08-06) * figures 1-4 * * paragraph [0078] * -----	1-3, 6, 7, 9, 14, 15	
A	WO 2017/005319 A1 (ARCELIK AS [TR]) 12 January 2017 (2017-01-12) * figure 2 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC) D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 July 2022	Examiner Werner, Christopher
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 15 6757

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-07-2022

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2020270793 A1	27-08-2020	EP 3543393 A2	25-09-2019
		KR 20180055420 A	25-05-2018
		US 2020270793 A1	27-08-2020
		WO 2018093201 A2	24-05-2018

US 2020248381 A1	06-08-2020	AU 2020200687 A1	20-08-2020
		EP 3690113 A1	05-08-2020
		KR 20200095911 A	11-08-2020
		US 2020248381 A1	06-08-2020

WO 2017005319 A1	12-01-2017	EP 3320139 A1	16-05-2018
		WO 2017005319 A1	12-01-2017

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 106968090 A [0002]